

PATENT
Attorney Docket No.: N0188US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

INVENTORS: Mark Barton

TITLE: METHOD AND SYSTEM FOR OBTAINING USER
FEEDBACK REGARDING GEOGRAPHIC DATA

ATTORNEYS: Frank J. Kozak
Jon D. Shutter
NAVIGATION TECHNOLOGIES CORPORATION
222 Merchandise Mart Plaza, Suite 900
Chicago, IL 60654
312/894-7000

1 METHOD AND SYSTEM FOR
2 OBTAINING USER FEEDBACK
3 REGARDING GEOGRAPHIC DATA
4

5 BACKGROUND OF THE INVENTION

6 The present invention relates to geographic data used in navigation systems and
7 more particularly the present invention relates to a method and system to obtain end user
8 input regarding perceived errors or inaccuracies in the geographic data used in navigation
9 systems or used by on-line sites that provide navigation-related or map-related services.

10 Navigation systems provide useful features, such as calculating a route to a
11 desired destination and providing guidance for following the route. In order to provide
12 these features, navigation systems use geographic data that include information about the
13 locations of roads and intersections, estimated travel times along road segments, the
14 speed limits along roads, etc. Using these kinds of geographic data, programming
15 included in a navigation system can find an optimal (e.g., fastest or shortest) route to a
16 specified destination.

17 Although navigation systems provide useful features, there still exists room for
18 improvement. One area in which there is room for improvement relates to the collection
19 of geographic data. The collection of geographic data for use in navigation systems is a
20 significant undertaking. The initial collection of data about the roads in a geographic
21 area is a significant task. Beyond the effort involved in collecting data for use in
22 navigation systems, there is a continuing need to update and check the geographic data.
23 Just like conventional printed maps, geographic data used in navigation systems becomes
24 out-of-date. For example, new roads are built, businesses change locations, road
25 construction closes roads, detours are established, museum and restaurant hours change,
26 etc. Thus, the collection of geographic data for navigation systems is a continuing effort.

1 One useful way to collect geographic data is to obtain feedback from end users
2 who have navigation systems. End users who have navigation systems may discover that
3 certain geographic data used in their navigation systems are not correct or are inaccurate.
4 When this occurs, it would be useful to provide a means by which the end user can report
5 the error or inaccuracy to the geographic database developer. Using such reports from
6 end users, the geographic database developer can make corrections to a master copy of
7 the geographic database, which is then used to make new, updated versions of geographic
8 databases for use in navigation systems.

9 End users can also obtain navigation-related and map-related services from
10 on-line providers. For example, routing instructions and maps can be obtained from
11 certain Internet sites. These on-line providers may use the same or similar geographic
12 data that are used in vehicle navigation systems. End users who use on-line provider sites
13 to obtain navigation-related and map-related services may also encounter errors or
14 inaccuracies in the geographic data. Accordingly, it would also be useful to obtain
15 feedback from the end users that use on-line provider sites to obtain navigation-related
16 and map-related services about perceived errors in the geographic data.

17 Accordingly, there exists a need to obtain end user feedback about perceived
18 errors in geographic data used in navigation systems or by on-line sites that provide
19 navigation-related and map-related services.

20 21 SUMMARY OF THE INVENTION

22 To address these and other objectives, the present invention comprises a reporting
23 program and system whereby end users of navigation systems, or other computing
24 platforms that use geographic data to obtain navigation-related or map-related services,
25 can make reports about the geographic data. The reporting program can be used by end
26 users to report perceived errors or inaccuracies in the geographic data. The end users can
27 use their own personal computers, or other computing devices, to access the reporting
28 program over a network, such as the Internet. When an end user accesses the reporting
29 program, the reporting program provides a graphical map image to the end user on the
30 end user's computing platform. The reporting program allows the end user to zoom and

1 pan the graphical map image in order to display an image of the area about which the end
2 user wishes to make a report. When the area about which the end user wishes to make a
3 report is displayed on the end user's display screen, the reporting program allows the end
4 user to mark up the graphical map image to illustrate a change. The reporting program
5 also allows the end user to include text to describe a change. The reporting program
6 captures the end user's graphical and text input as a report that is used to update or check
7 the geographic database, as appropriate.

9 BRIEF DESCRIPTION OF THE DRAWINGS

10 Figure 1 is a block diagram of a system for collecting end user feedback regarding
11 a geographic database.

12 Figure 2 is a flow chart of steps performed by the reporting program of Figure 1.

13 Figure 3 illustrates an end user's computer display screen at one step of the
14 process shown in Figure 2.

15 Figure 4 illustrates use of the drawing tools to report a perceived geographic data
16 error according to the reporting program of Figure 1.

17 Figure 5 illustrates another use of the drawing tools to report a perceived
18 geographic data error according to the reporting program of Figure 1.

19 Figure 6 illustrates still another use of the drawing tools to report a perceived
20 geographic data error according to the reporting program of Figure 1.

21 Figure 7 is a flow chart of steps performed to update a geographic database using
22 the reporting program of Figure 2.

24 DETAILED DESCRIPTION OF THE 25 PRESENTLY PREFERRED EMBODIMENTS

26 Referring to Figure 1, a database developer 100 operates a reporting program 110.
27 The reporting program 110 is located on a server 120 that is connected to a network 130,
28 such as the Internet. End users 150 operate computing platforms 140 to access the
29 reporting program 110. The computing platforms 140 used by the end users 150 can be
30 any type of device or system that is able to access the server 120 over the network 130.
31 For example, the computing platforms 140 include personal computers 140(1) and

1 vehicle navigation systems 140(2). The computing platforms 140 may also include other
2 types of computing devices or systems, such as personal digital assistants.

3 The computing platforms used by end users include appropriate software to
4 access the server 120 over the network 130. If an end user uses a personal computer to
5 access the server 120, the reporting program 110 may be accessed using an Internet
6 browser. Other communications software may also be used.

7 The end users 150 access the reporting program 110 in order to make reports
8 about geographic data. In particular, the reporting program 110 may be used by the
9 geographic database developer 100 to obtain reports from the end users 150 about
10 perceived errors or inaccuracies in the geographic data used in the navigation systems of
11 the end users or by on-line provider sites that are used by the end users to obtain
12 navigation-related and map-related services. The perceived errors or inaccuracies can be
13 of any type and may be encountered in various different ways. One of the ways that end
14 users can encounter perceived errors or inaccuracies is during operation of in-vehicle
15 navigation systems. For example, while being guided to follow a route to a destination, a
16 navigation system may provide the end user with incorrect, inaccurate or confusing
17 guidance. According to this example, the navigation system may advise the end user to
18 'TURN LEFT AT THE NEXT INTERSECTION' but the next intersection has a sign
19 that prohibits left turns. According to another example, the navigation system may
20 identify a street by a wrong name.

21 There are various reasons why a navigation system may provide incorrect,
22 inaccurate or confusing guidance to an end user. One possible cause is that the
23 geographic data used by the navigation system may be incorrect. The geographic data
24 may be incorrect because of an error made when the data were being collected.
25 Alternatively, the geographic data used by the navigation system may be incorrect
26 because the physical feature represented by the geographic data changed since the time
27 the geographic data used by the end user's system was prepared.

28 Another possible cause for an end user receiving incorrect, inaccurate or
29 confusing guidance from a navigation system can be an error in the software
30 programming in the navigation system. In this case, the geographic data may be correct

1 but the end user receives incorrect, inaccurate or confusing guidance because the
2 software programming the navigation system does not use the geographic data properly.
3 For example, if the navigation system software determines a vehicle's position
4 incorrectly, a wrong street name may be provided thereby giving the end user the
5 impression that the geographic data are incorrect when in fact the navigation
6 programming caused the error.

7 Another reason why a navigation system may provide incorrect or confusing
8 guidance is that the geographic data used by the navigation system may not include the
9 attributes that are necessary to provide better instructions. For instance, the data
10 representing roads located in some geographic areas may not contain one-way
11 information because one-way street information has not yet been collected for those
12 areas. Alternatively, the software programming in the navigation system may not
13 consider one-way streets when providing driving directions.

14 As mentioned above, navigation-related and map-related services can also be
15 obtained from on-line providers. End users may access on-line provider sites from their
16 own personal computers or other platforms or appliances to obtain navigation-related and
17 map-related services. An end user using an on-line provider site to obtain navigation-
18 related and map-related services may also encounter incorrect, inaccurate or confusing
19 information. On-line providers of navigation-related or map-related services may use the
20 same or similar geographic data and software programming that are used in vehicle
21 navigation systems. Therefore, on-line provider sites may give incorrect, inaccurate or
22 confusing navigation-related or map-related information for the same reasons as
23 explained above in connection with vehicle navigation systems.

24 Regardless of the cause of a perceived error, the reporting program 110 provides a
25 means by which a report about the perceived error can be obtained from an end user. As
26 stated above, the end users 150 operate computing platforms 140 to access the reporting
27 program 110. The computing platform 140 used by an end user to access the reporting
28 program 110 may not necessarily be the same computing platform that the end user was
29 using when the navigation-related or map-related information containing the perceived
30 error was obtained. For example, an end user may perceive an error with the geographic

1 data used by his/her vehicle navigation system while driving in his/her vehicle, but then
2 accesses the reporting program later at home using his/her personal computer with
3 Internet access.

4 Some of the steps performed by the reporting program 110 are shown in Figure 2.
5 When the end user accesses the reporting program 110, the reporting program 110
6 presents the user with a menu of options (Step 200). One of the options presented on the
7 menu is to make a report about a geographic database. When the user chooses the option
8 of making a report, the reporting program 110 requests the end user to identify the
9 version of the geographic database to which the report pertains (Step 204). After the end
10 user supplies information identifying the version of the database, the reporting program
11 110 presents the end user with the option of viewing a map image of the area about which
12 the end user desires to make a report (Step 208). If the user chooses not to view an image
13 of the map area, the reporting program 110 presents the user with a means to provide a
14 text input (described below in connection with Step 240). Alternatively, if the end user
15 chooses to view an image of the map area, the reporting program 110 presents the end
16 user with a means to select an area (Step 212).

17 When the reporting program 110 presents a map image to the end user, the
18 reporting program accesses a geographic database 216. The geographic database 216
19 may be a copy of, or similar or identical to, the geographic database used by the end
20 user's navigation system. The geographic database 216 used by the reporting program
21 110 is preferably up-to-date, i.e., it includes all the changes reflecting all the most recent
22 updating efforts. Thus, the geographic database 216 used by the reporting program 110
23 may be more up-to-date than the geographic database that was used by the end user's
24 navigation system when the perceived error arose.

25 As stated above, if the end user chooses to view an image of the map area, the
26 reporting program 110 presents the end user with a means to select an area. There are
27 various ways that the reporting program 110 allows the end user to select the area about
28 which to make a report. One way is by panning and zooming. According to one method,
29 the end user is first presented with an image of a large scale map, e.g., the entire United
30 States (Step 220). When the end user is provided with a map, the reporting program 110

1 allows the end user to select an area of the map, e.g., by pointing-and-clicking on a
2 location on the map image (Steps 224 and 228).

3 Figure 3 illustrates the display of the end user's computer 140 with a graphical
4 map image displayed thereon. As shown in Figure 3, a cursor 230 can be moved over the
5 map image to a position in order to select the area indicated by the cursor.

6 Referring again to Figure 2, when the end user selects an area of the large scale
7 map, the reporting program 110 captures the end user's input and uses the input to
8 present the end user with another map image of the area selected by the end user.

9 Depending upon the end user's input, this new map image may be at a smaller scale or
10 may be panned relative to the previous map image. By successive selections, the end
11 user is able to operate the reporting program 110 to present a map image of the individual
12 street segments about which the end user desires to make a report.

13 As stated above, there are various ways that the reporting program 110 can allow
14 the end user to select an image of an area about which to make a report. These other
15 ways include allowing an end user to identify the area by administrative area name (e.g.,
16 Des Plaines, Illinois), by address, by point of interest name (e.g., O'Hare Airport), by
17 street name, by zip code, or by intersection. When the end user chooses any of these
18 ways to select an area about which to make a report, a graphical map image of the
19 selected area is presented to the end user on the display screen of the end user's
20 computing platform. The reporting program 110 allows the end user to pan and zoom the
21 map image, as described above, to obtain a map image of the area about which to make a
22 report, at the appropriate scale.

23 When the end user has a map image of the area about which he/she desires to
24 make a report on the display screen of his/her computer, the reporting program 110
25 provides the end user with drawing tools (Step 232). The drawing tools include features
26 commonly used by computer-assisted drawing programs for marking or editing images.
27 The drawing tools include a feature that allows the end user to select one or more
28 individual road segments. For example, by pointing-and-clicking on a road segment, the
29 end user can select the road segment. When the end user uses the reporting program 110
30 to select a road segment, the road segment may be highlighted by changing color,

1 blinking, etc. Figure 4 illustrates the display of the end user's computer 140 with a
2 graphical map image of individual road segments displayed thereon. As shown in
3 Figure 4, the end user has selected a road segment (which is shown in a different color at
4 233) to indicate the feature to which the report pertains.

5 The drawing tools also include a feature that allows the end user to select an area.
6 According to this feature, the end user can draw a box or circle on the map image to
7 define an area. Figure 5 illustrates the display of the end user's computer 140 with a
8 graphical map image of individual road segments displayed thereon. As shown in
9 Figure 5, the end user has drawn a circle 234 over a location on the map image in order to
10 indicate the area to which the report pertains.

11 The drawing tools also include a feature that allows the end user to mark the
12 image. For example, by choosing this feature, the end user is able to draw lines on the
13 map image. This allows the end user to graphically illustrate a correction to the map
14 image.

15 The following examples illustrate several ways that an end user can use the
16 drawing tools of the reporting program 110 to make reports about perceived errors in the
17 geographic data.

18 Example 1. The end user wishes to report that two road segments, which are
19 represented on the map image as meeting at an intersection, do not actually meet. The
20 end user can select one of the road segments by clicking on it and then use the line draw
21 feature to cross out a portion of the road segment where it meets with the other road
22 segment to illustrate that the two road segments do not actually meet.

23 Example 2. The end user wishes to report that the map image omits a road
24 segment. The end user uses the line drawing feature of the reporting program to draw in
25 the missing road segment on the map image.

26 Example 3. The end user wishes to report that a road segment, which is
27 represented as permitting vehicular traffic in two directions, is in fact a one-way street.
28 The end user selects the road segment by clicking on it and then uses the line draw
29 feature to draw an arrow in the single direction of permitted traffic flow.

1 Example 4. The end user wishes to report that he/she was given guidance to
2 follow a route that was not optimal. Using a line drawing feature, the end user can trace a
3 better route along the road segments shown on the graphical map image provided by the
4 reporting program.

5 Using these drawing tools, the end user is able to graphically illustrate an error or
6 a correction to the geographic data. Referring again to Figure 2, the reporting program
7 110 captures the end user's graphical input (Step 236).

8 When the end user uses any of these graphical drawing features to illustrate a
9 change to the geographic database for a report, the reporting program 110 also provides a
10 feature that allows the end user to submit text comments (Step 240). According to this
11 feature, the reporting program 110 may provide the end user with a text box. The text
12 box can be opened by clicking on a menu item or link provided on the page being
13 presented on the end user's display screen. Figure 6 illustrates the display of the end
14 user's computer 140 with a text box 242 that the end user can use to provide comments
15 about a perceived error in the geographic database. The text box may be used as a
16 substitute for or in addition to providing comments graphically. Some of the types of
17 changes that an end user may wish to report may not be possible to express graphically.
18 Furthermore, some end users may not know how to use the drawing tools features to
19 clearly express the change they wish to report. Accordingly, by providing a text box, the
20 reporting program 110 allows an end user to describe an error with the geographic data
21 using words. The reporting program 110 captures the end user's text input.

22 After the end user has submitted text comments, the reporting program 110 saves
23 the end user's graphical and text input in a report file 248 (Step 244). Then, the end user
24 may use the reporting program again to make a report about another perceived error (Step
25 252) or alternatively, the end user may log off the reporting program 110. At this point,
26 the end user may be sent a message thanking him/her for submitting the report.

27 Referring to Figure 7, the data in the reports database 248 are used in a
28 geographic database updating process 300. The geographic database updating process
29 300 may be performed by the geographic database developer (100 in Figure 1).
30 According to one embodiment, the geographic database updating process 300 receives

1 the data from the reports database 248 (Step 310). Each of the reports in the reports
2 database 248 is analyzed and confirmed (Step 320). The report may be confirmed by
3 examining an aerial photograph, by traveling out to the location represented by the data,
4 or by other means. When the error is confirmed, the correct information is added to the
5 geographic database, thereby forming an updated version 216 (updated) (Step 330). At
6 this point, the end user who submitted the report concerning the error may be sent a
7 message (e.g., by email) informing him/her that the master copy of the geographic
8 database has been corrected and updated. When the database 216 has been updated,
9 derived database products reflecting the updated data are made and distributed to the end
10 users (Step 340). The end users may be provided with an opportunity to obtain or
11 purchase copies of the updated database.

12

13 Advantages

14 One advantage of the disclosed system is that the graphical map image provided
15 by the reporting program may help an end user remember details about a perceived error.
16 As mentioned above, the reporting program may be accessed by an end user from a
17 different computing platform than the platform that was being used by the end user to
18 obtain the navigation-related or map-related services. For example, the end user may
19 perceive an error while driving and using his/her navigation system, but then access the
20 reporting program later from home using a personal computer with Internet access.
21 When the end user accesses the reporting program later from his/her home, he/she may
22 not remember details about the perceived error. The graphical map image provided by
23 the reporting program may help the end user recall details about the perceived error
24 thereby making the reporting of the error easier and more meaningful.

25 Another advantage of the disclosed system is that it allows an end user to know
26 whether the perceived error has already been reported or corrected. As stated above, the
27 reporting program uses a geographic database to provide map images to end users so that
28 the end users can use these map images to make reports about perceived errors in the
29 geographic database. As mentioned above, the geographic database used by the reporting
30 program is preferably up-to-date and reflects the most recent changes and corrections.

1 Therefore, the geographic database used by the reporting program may be more up-to-
2 date than the geographic database used by the end user making the report. Thus, it is
3 possible that the perceived error may already have been corrected.. If the end user notices
4 that the error that he/she was going to report has already been corrected when viewing the
5 map image provided by the reporting program, the end user can exit the reporting
6 program and not waste any time reporting an error that has already been corrected.

7 Another advantage of the disclosed system is that it can be used to improve the
8 software used by navigation systems. As stated above, an error perceived by an end user
9 may be caused by the software used by the navigation system and not the geographic
10 data. The reports provided by end users may be used to improve or correct the software
11 in navigation systems to avoid or minimize these types of errors.

12 Another advantage of the disclosed system is that the end user is provided with an
13 opportunity to be involved in the updating process. This involvement may help develop
14 good will between the end user and the geographic database developer.

15
16 It is intended that the foregoing detailed description be regarded as illustrative
17 rather than limiting and that it is understood that the following claims including all
18 equivalents are intended to define the scope of the invention.